ABSTRACTS (MASTER THESIS)

Investigation of wooden artifacts in Korea – durability of yellow heart pine and vessel arrangement in hardwood species used in woodblocks

**(Graduate School of Agriculture,
Laboratory of Biomass Morphogenesis and Information, RISH, Kyoto University)**

Lee Jihye

I conducted my study about historically and culturally important wooden artifacts in Korea. Firstly, biological durability of Yellow Heart Pine (Hwangjangmok) that has been long used in traditional imperial wooden constructions in Korea was investigated. Secondary, the development of non-destructive analytical methods to investigate wood properties of important cultural asset, in my case, Tripotaka Koreana, was conducted.

Hwangjangmok, *Pinus densiflora* for. *erecta* Uyeki was a kind of red pine[1)] that were often older than 100 years. It had relatively large reddish-brown heartwood, narrow and even annual-ring width. The termite test, white-rot fungi test and brown-rot fungi test were performed. However, to my surprise, there was no remarkable difference between normal red pine and Hwangjangmok.

Tripitaka Koreana, a 13th century edition of scriptures known to be the world's most comprehensive and oldest intact version of Buddhist scriptures, engraved on 81,340 wooden plates during Koryo Dynasty from 1236 to 1251 A.D. The printing woodblocks has been maintained over several centuries partly because the Haeinsa temple located away in a secluded valley in the deep mountains, and partly because the storage building of woodblocks was so well designed to keep them dry.

According to the latest survey from 244 wooden samples collected from Tripitaka Koreana, more than 62% of whole specimens investigated was *Prunus sp*., which were used in wooden plate 64%, and wooden plate edge 56%. *Pyrus sp*. was used 13% of whole specimens and 31% of wooden plates. Therefore, 75% of whole Tripitaka Koreana was made by these two species. As minor selections, *Acer sp*., *Betula sp*., *Machilus* sp., *Cornus* sp., *Daphnilhyllum* sp. were reported [2)]. After Tripitaka Koreana was registered in World Cultural Heritage in 1996, identification of whole samples were demanded but non-destructive technique for identification became prerequisite. It is in such a situation that I started to investigate applicability of X-ray CT technique for wood identification.

Assuming 0.1mm resolution of a conventional CT instrument, density of the vessel distribution was mainly concerned. From the optical transverse sections of above mentioned woodblock species, the position of vessel element was obtained and their spatial distribution was analyzed by spatial point pattern analysis (Spatstat) program[3)]. Among several characteristic features obtained from this analysis, L-function was found to be the best to distinguish species tested. Although I did not have direct access to the CT images, this preliminary study suggested the potential of image analysis for non-destructive analysis of species used in Tripitaka Koreana using a conventional CT measurement.

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References

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